Claims

What is claimed is:

1. A lubricant circulation system for a shaft that rotates in a bearing, the system comprising an oil ring for drawing lubricant from a lubricant source and delivering the lubricant to a clearance defined between the shaft and the bearing, and a conduit connected to the clearance for receiving lubricant from the clearance and delivering the lubricant back to the lubricant source.

2. The lubricant circulation system of claim 1 further comprising an axially-extending slot formed in the bearing for collecting a portion of the lubricant drawn from the lubricant source.

3. The lubricant circulation system of claim 2 further comprising a radially-extending port formed through the bearing and connecting the clearance and the conduit.

4. The lubricant circulation system of claim 1 further comprising a radially-extending port formed through the bearing and connecting the clearance and the conduit.

5. The lubricant circulation system of claim 3 wherein the lubricant in the clearance is transferred to the conduit by the pressure differential between the clearance and the conduit.

6. The lubricant circulation system of claim 1 wherein the conduit delivers the lubricant from the clearance to a lower portion of the lubricant source.

7. The lubricant circulation system of claim 1 wherein a portion of the lubricant drawn from the lubricant source follows a closed-loop circulation path.

8. The lubricant circulation system of claim 7 wherein the closed-loop circulation path is defined from the lubricant source, to the oil ring, through the clearance, through the conduit, and back to the lubricant source.

9. The lubricant circulation system of claim 3 wherein a portion of the lubricant drawn from the lubricant source follows a closed-loop circulation path defined from the lubricant source, to the oil ring, through the slot, through the clearance, through the port, through the conduit, and back to the lubricant source.

10. The lubricant circulation system of claim 1 wherein the lubricant source is an oil sump.

11. A lubricant circulation system for a rotating member and a stationary member, the system comprising means for drawing lubricant from a lubricant source and delivering the lubricant to a clearance defined between the rotating member and the stationary member, and means for utilizing the pressure generated between the rotating member and the stationary member to circulate a portion of the lubricant drawn from the lubricant source through the clearance and back to the lubricant source.

12. The lubricant circulation system of claim 11 wherein a portion of the lubricant drawn from the lubricant source follows a closed-loop circulation path defined from the lubricant source, through the clearance, and back to the lubricant source.

13. A lubricant circulation system for a shaft that rotates in a bearing, the system comprising an oil ring for drawing lubricant from a lubricant source and delivering the lubricant to a clearance defined between the shaft and the bearing, a first conduit connected to the clearance for receiving lubricant from the clearance and delivering the lubricant to an external reservoir, and a second conduit linking the external reservoir to the lubricant source for delivering lubricant from the external reservoir to the lubricant source.

14. The lubricant circulation system of claim 13 wherein the external reservoir is a cooler.

15. The lubricant circulation system of claim 13 wherein a portion of the lubricant drawn from the lubricant source follows a closed-loop circulation path defined from the lubricant source, to the oil ring, through the clearance in the bearing, through the first conduit, through the external reservoir, through the second conduit, and back to the lubricant source.

16. The lubricant circulation system of claim 13 further comprising a radially-extending port formed through the bearing and connecting the clearance and the conduit.

17. The lubricant circulation system of claim 16 wherein the lubricant in the clearance is transferred through the port by the pressure generated by rotation of the shaft in the bearing.

18. A lubricant circulation system for a rotary machine, the system comprising:

a first source of lubricant,

a first bearing,

means for utilizing pressure generated within the first bearing for circulating lubricant drawn from the first lubricant source through the first bearing;

a second source of lubricant;

a second bearing;

means for utilizing pressure generated within the second bearing for circulating lubricant drawn from the second lubricant source through the second bearing;

a conduit connecting the first bearing to the second lubricant source;

a conduit connecting the second bearing to the second lubricant source;

a reservoir; and

at least one conduit connecting the reservoir to at least one of the lubricant sources.

19. The system of claim 18 wherein the at least one conduit connects the second lubricant source to the reservoir.

20. The system of claim 19 wherein lubricant in the second lubricant source is circulated through the at least one conduit to the reservoir.

21. The system of claim 18 wherein the at least one conduit connects the reservoir to the first lubricant source.

22. The system of claim 21 wherein lubricant in the reservoir is circulated through the at least one conduit to the first lubricant source.

23. The system of claim 18 wherein a conduit connects the second lubricant source to the reservoir, and another conduit connects the reservoir to the first lubricant source.

24. The system of claim 18 wherein lubricant in the second lubricant source is circulated through a conduit to the reservoir; and wherein lubricant in the reservoir is circulated through another conduit to the first lubrication source.

25. The system of claim 18 wherein lubricant circulates in a closed-loop circulation path including the lubricant sources, the bearings, the conduits, and the reservoir.

26. The system of claim 18 wherein the bearings surround a shaft and are disposed in an axially spaced relation along the shaft.

27. The system of claim 26 further comprising an oil ring extending around the shaft and in a slot in the first bearing and extending in the first lubrication source so that rotation of the shaft and the oil ring draws lubricant from the first lubricant source to the first bearing.

28. The system of claim 26 further comprising an oil ring extending around the shaft and in a slot in the second bearing and extending in the second lubrication source so that rotation of the shaft and the oil ring draws lubricant from the second lubricant source to the second bearing.

29. A lubricant circulation method for a rotary machine, the method comprising:

circulating lubricant drawn from a lubricant source through a bearing to a conduit utilizing pressure generated within the bearing; and

circulating lubricant through the conduit and back to the lubricant source to complete circulation of the lubricant through a closed-loop circulation path.

30. The method of claim 29 wherein the bearing surrounds a shaft.

31. The method of claim 30 further comprising providing an oil ring extending around the shaft and in a slot in the bearing and extending in the first lubrication

source so that rotation of the shaft and the oil ring draws lubricant from the lubricant source to the bearing.

32. The method of claim 29 wherein lubricant circulated from the lubricant source collects in a lubricant feed slot formed in the bearing before circulating to the conduit.

33. A lubricant circulation method for a rotary machine, the method comprising:

circulating lubricant drawn from a first lubricant source through a first bearing to a conduit utilizing pressure generated within the first bearing;

circulating lubricant drawn from a second lubricant source through a second bearing to a conduit utilizing pressure generated within the second bearing;

passing lubricant from the first bearing to the second lubricant source;

passing lubricant from the second bearing to the second lubricant source; and

passing lubricant between a reservoir and at least one of the lubricant sources.

34. The method of claim 33 wherein lubricant is passed from the second lubricant source to the reservoir.

35. The method of claim 34 wherein the passage of lubricant from the second lubricant source to the reservoir is assisted by gravity.

36. The method of claim 33 wherein lubricant is passed from the reservoir to the first lubricant source.

37. The method of claim 36 wherein the passage of lubricant from the reservoir to the first lubricant source is assisted by gravity.

38. The method of claim 33 wherein lubricant is passed from the second lubricant source to the reservoir, and from the reservoir to the first lubricant source.

39. The method of claim 38 wherein the passage of lubricant from the second lubricant source to the reservoir, and from the reservoir to the first lubricant source is assisted by gravity.

40. The method of claim 33 further comprising establishing a closed-loop circulation path for the lubricant, the path including the lubricant sources, the bearings, and the reservoir.

41. The method of claim 33 wherein the bearings surround a shaft and are disposed in an axially spaced relation along the shaft.

42. The system of claim 41 further comprising providing an oil ring extending around the shaft and in a slot in the first bearing and extending in the first lubricant source so that rotation of the shaft and the oil ring draws lubricant from the first lubricant source to the first bearing.

43. The system of claim 41 further comprising providing an oil ring extending around the shaft and in a slot in the second bearing and extending in the second lubricant source so that rotation of the shaft and the oil ring draws lubricant from the second lubricant source to the second bearing.